

**Remarks:****Claims**

By the present amendment, claims 1, 2, 19 and 21 are cancelled without prejudice to the subject matter therein; claims 3, 17 and 18 are amended and new claims 25-26 have been added. Accordingly, claims 3-20 and 25-26 are pending.

Support for the amendments can be found at, for example, page 6, lines 30-32. Support for claims 25 and 26 can be found at, for example, in the paragraph bridging pages 8 and 9. No new matter is added.

**Claim Rejections - 35 U.S.C. §102(e) - Hirota'927**

A. Claims 1-2 stand rejected under 35 U.S.C. §102(e) for allegedly being anticipated by Hirota et al. (Hirota'927) (United States Patent No. 6,233,927 B1). In particular, the Office Action asserts:

Regarding claims 1-2, Hirota discloses a diesel engine exhaust system comprising a soot filter (e.g., 7, 19); and low temperature NO<sub>2</sub> trap (11) deposited on a carrier upstream and in train with the soot filter (e.g. See Fig. 5; col. 7, lines 23-67; col. 8, lines 1-15); wherein the exhaust system further comprises a diesel oxidation catalyst (18) upstream of the carrier with the deposited NO<sub>2</sub> trap material (e.g. See Fig. 4).

The Examiner considered Applicant's arguments filed May 5, 2003, but asserted that there were not persuasive. Specifically, the Office Action contended:

Applicants have argued that Hirota does not teach or suggest Applicant's claimed invention. More specifically, Applicant asserts that the reference to Hirota fails to disclose a "low temperature NO<sub>2</sub> trap material". The Examiner respectfully disagrees, any NO<sub>2</sub> trap in the exhaust gas system of any internal combustion engine is a low temperature NO<sub>2</sub> trap, since the exhaust gas temperature of an internal combustion engine is less than 1000 °C, which is too low to compare to the exhaust gas temperature of a jet engine (greater than thousands Celsius degree) or the SUN's temperature (greater than millions Celsius degree). In addition, Applicant has not claim what temperature range would be considered as a low temperature range; therefore, the use of low temperature NO<sub>2</sub> trap material is so notoriously well known in the art, so as to be proper for official notice.

Without conceding the correctness of the rejection, and solely to expedite prosecution, Applicant has cancelled claims 1 and 2. The asserted basis for the rejection is therefore now absent, and reconsideration and withdrawal of the rejection are respectfully requested.

*Claim Rejections - 35 U.S.C. §103(a) - Hirota'927 and Hirota'246*

Claims 3-5 and 10-21 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Hirota'927 in view of Hirota et al. (Hirota'246) (U.S. Patent No. 6,367,246 B1). In particular, the Office Action contends:

Regarding claims 3, 17-18, and 21, Hirota'927 discloses a diesel engine exhaust system comprising: a soot filter (e.g. 7, 19); and low temperature NO<sub>2</sub> trap (11) deposited on a carrier upstream and in train with the soot filter (See col. 3, lines 32-67; col. 4, lines 1-14). However Hirota'927 fails to disclose that the low temperature NO<sub>2</sub> trap material comprising zeolites selected from the group consisting of acidic zeolites and base metal-exchanged zeolites.

Hirota'246 teaches that it is conventional in the art, to use a low temperature NO<sub>2</sub> trap material comprising zeolites selected from the group consisting of acidic zeolites and base metal-exchanged zeolites (e.g. See col. 3, lines 32-67; col. 4, lines 1-14), which are carried on a carrier for absorbing the NO<sub>x</sub> when the air-fuel ratio of the exhaust gas flowing into the absorbent is lean, and releasing the NO<sub>x</sub> when the air-fuel ratio of the exhaust gas flowing into the absorbent is rich.

It would have been obvious to one having ordinary skill in the art at the time the invention was made, to use a low temperature NO<sub>2</sub> trap material comprising zeolites selected from the group consisting of acidic zeolites and base metal-exchanged zeolites of Hirota'927, as taught by Hirota'246 for the purpose of absorbing the NO<sub>x</sub> when the air-fuel ratio of the exhaust gas flowing into the absorbent is lean, and releasing the NO<sub>x</sub> when the air-fuel ratio of the exhaust gas flowing into the absorbent is rich, so as to reduce the poisoned materials in the purifying catalyst and to reduce amount of nitrogen oxides in the exhaust gas of the lean-burn engine, and further improve the performance of the engine and the efficiency of the emission device.

Regarding claim 4, Hirota'246 further discloses that the zeolites are selected from the group consisting of ZSM-5, ETS-10,  $\gamma$  zeolite, Beta zeolite, ferrierite, mordenite, titanium silicates, and aluminum phosphates (See col. 11, lines 5-47).

Regarding claim 5, Hirota'246 further discloses that the base metals are selected from the group consisting of Mn, Cu, Fe, Co, W, Re, Sn, Ag, Zn, Mg, Li, Na, K, Cs, Nd, Pr and combinations thereof (See col. 11, lines 5-47).

Regarding claim 10, Hirota'927 further discloses that the a diesel oxidation catalyst (18) upstream of the soot filter (7) (See Fig. 4).

Regarding claim 11, Hirota'927 further discloses that the NO<sub>2</sub> trap material (11) is deposited on a carrier that is interposed and in train with the diesel oxidation catalyst (18) and the soot filter (7) (see Fig. 4).

Regarding claim 12, Hirota'246 further discloses that the system comprising a canister, wherein the canister houses both the low temperature NO<sub>2</sub> trap material and the soot filter (See Fig. 4; col. 6, lines 10-56).

Regarding claim 13, Hirota'246 further discloses that the soot filter comprises a ceramic monolithic structure having an upstream axial end and a downstream axial end, the structure having parallel flow channels with macroporous walls, wherein the channels having an opening at the upstream axial end are closed at the downstream axial end, and the channels having an opening at the downstream axial end are closed at the upstream axial end, thereby defining upstream and downstream sides of the channel walls (See col. 3, lines 32-67; col. 4, lines 1-14).

Regarding claim 14, Hirota'246 further discloses a catalyst composition is deposited on the downstream side of the channel walls of the soot filter (See col. 3, lines 32-67; col. 4, lines 1-14).

Regarding claim 15, Hirota'246 further discloses that the catalyst composition, deposited on the downstream side of the channel walls of the soot filter, comprises a lean NO<sub>x</sub> catalyst composition (See col. 3, lines 32-67; col. 4, lines 1-14).

Regarding claim 16, Hirota'246 further discloses that the catalyst composition, deposited on the downstream side of the channel walls of the soot filter, comprises a catalyst composition effective for the combustion of unburned hydrocarbons and carbon monoxide (See col. 3, lines 32-67; col. 4, lines 1-14).

Regarding claim 19, Hirota'246 further discloses that the low temperature NO<sub>2</sub> trap material comprises zeolites selected from the group consisting of acidic zeolites and base-metal exchanged zeolites (See col. 3, lines 32-67; col. 4, lines 1-14).

Regarding claim 20, Hirota'246 further discloses that the exhaust system further comprises a lean NO<sub>x</sub> catalyst deposited on the soot filter (See col. 3, lines 32-67; col. 4, lines 1-14).

The Examiner considered Applicant's arguments filed May 5, 2003, but argued that they were unpersuasive. The Office Action posits:

Moreover, Applicants have argued that Hirota'927 in combination do not teach or suggest Applicant's claimed invention. The examiner respectfully disagrees with Applicants. Both Hirota-927 and Hirota'246 are directed to substantially solving the same problem as each other that of reducing nitrogen oxide and particulates in the exhaust gas of the internal combustion engine using a soot filter and NOx trap having claimed materials. It would have been obvious at the time the invention was made to a person of ordinary skill in the art, to use the NOx trap having different materials compounds and specific amounts in the Hirota'927 device as taught by Hirota'246 having both functional and structural equivalent in the art; consequently, Hirota'927 in combination with Hirota'246 clearly meets these limitations. Therefore, the examiner will not withdraw the rejection as request by the Applicants.

Applicant respectfully disagrees. In particular, Applicant disagrees that Hirota'246 teaches low temperature NO<sub>2</sub> trap material comprising zeolites selected from the group consisting of acidic zeolites and base-metal exchanged zeolites. Applicant notes that the portion of Hirota'246 where the Office Action cites a description of NO<sub>2</sub> trap material (i.e., col. 3, lines 32-67; col. 4, lines 1-14), does not, in fact, disclose the low temperature NO<sub>2</sub> trap material described in instant claim 3. Hirota'246 describes the NO<sub>2</sub> trap material as follows at col. 3, lines 61-66:

The NOx storing member **62** is formed of a NOx adsorbent **62a**. This NOx adsorbent **62a** is comprised of at least one selected from a precious metal including palladium Pd, platinum Pt, and rhodium Rh, a transition metal including copper Cu and iron Fe, and lithium Li, carried on a carrier of alumina, for example...

Applicant submits that Hirota'246 does disclose zeolite materials. However, these materials are disclosed in the context of their use as hydrocarbon adsorbent (see col. 4, lines 14-19). Accordingly, absent the disclosure of low temperature NO<sub>2</sub> trap material comprising zeolites selected from the group consisting of acidic zeolites and base-metal exchanged zeolites as recited in instant claim 3, Hirota'246 fails to underpin the obviousness rejection.

Reconsideration is therefore respectfully requested.

Claim Rejections - 35 U.S.C. §103(a) - Hirota'927, Hirota'246 and Deeba

Claims 6-9 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Hirota'927 in view of Hirota'246 as applied to claims 3, 17-18 and 21, and further in view of Deeba et al. (Deeba) (U.S. Patent No. 6,093,378). Specifically, the Examiner posits:

Regarding claim 6, Hirota'927 in view of Hirota'246 discloses all the claimed limitation as discussed above except that the zeolites comprise a trivalent metal which in combination with Si forms an oxidic skeleton.

Deeba discloses a diesel engine exhaust system comprising: a low temperature NO<sub>2</sub> trap material comprising zeolites selected from the group consisting of acidic zeolites and base metal-exchanged zeolites, and wherein the low temperature NO<sub>2</sub> trap material is deposited on a carrier, wherein the zeolites comprise a trivalent metal which in combination with Si forms an oxidic skeleton (See col. 10, line 5-67; col. 11, lines 1-45).

It would have been obvious to one having ordinary skill in the art at the time the invention was made, to use a low temperature NO<sub>2</sub> trap material comprising zeolites selected from the group consisting of acidic zeolites and base metal-exchanged zeolites of Hirota'927 in view of Hirota'246, as taught by Deeba for the purpose of absorbing the NO<sub>x</sub> when the air-fuel ratio of the exhaust gas flowing into the absorbent is lean, and releasing the NO<sub>x</sub> when the air-fuel ratio of the exhaust gas flowing into the absorbent is rich, so as to reduce the poisoned materials in the purifying catalyst and to reduce amount of nitrogen oxides in the exhaust gas of the lean-burn engine, and further improve the performance of the engine and the efficiency of the emission device.

Regarding claim 7, Deeba further discloses that the trivalent metal comprises at least one metal selected from the group consisting of Al, B, Ga, In, Fe, Cr, V, As and Sb (See col. 10, lines 5-67; col. 11, lines 1-45).

Regarding claim 8, Deeba further discloses that the zeolites comprise three-dimensional alumina-silicate zeolites characterized by pore openings whose smallest cross-section dimensions are at least 5 Angstroms and having a silicon to alumina ratio of at least 5 (See col. 10, lines 5-67; col. 11, lines 1-45).

Regarding claim 9, Deeba further discloses that the zeolites comprise titanium silicates (See col. 12, lines 10-67; col. 13, lines 1-32).

Applicant respectfully disagrees with the rejection regarding claims 6-9. As noted above, Hirota'246 fails to disclose low temperature NO<sub>2</sub> trap material comprising zeolites selected from the group consisting of acidic zeolites and base-metal exchanged zeolites as described in Applicant's claims. Hirota '246 therefore fails to underpin the obviousness rejection with regard

to claims 3-5 and 10-21. Therefore, the rejection of claims 6-9 further in view of Deeba cannot stand.

Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

**FEE DEFICIENCY**

☒ If an extension of time is deemed required for consideration of this paper, please consider this paper to comprise a petition for such an extension of time; The Commissioner is hereby authorized to charge the fee for any such extension to Deposit Account No. 04-0480.

**and/or**

☒ If any additional fee is required for consideration of this paper, please charge Account No. 04-0480.

**Closing Remarks**

Applicants thank the Examiner for the Office Action and believe this response to be a full and complete response to such Office Action. Accordingly, favorable reconsideration in view of this response and allowance of the pending claims are earnestly solicited.

Respectfully submitted,



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